CSE Solution

Here is the answer to last month's CSE Question #P201. We would like to thank those of you who sent in your solutions. **Allen Houtz** of Industrial Instruments & Automation Systems, Kenai, AL answered October's question #A601 correctly. Don't forget to send us your answers to this month's question, which appears on page 21. Contact us via the *INTECH* forum in ISA On-Line at 412/967-5347, via fax at 919/549-8288, or via Internet at jham@isa.org.

1. $F_2 = 0.95\,F_1$

   Flow is NOT critical because $\frac{(P_A - P_B)}{P_A} = \frac{(15-10)}{15} < 0.5$

   therefore the Bernoulli equation for mass flow applies and flow is proportional to $\sqrt{(P_A - P_B)\rho_A}$ and density is proportional to mole weight

   $$F_2 = \sqrt{\frac{36}{40}}F_1 = \sqrt{0.90}F_1 = 0.948F_1$$

   The correct answer is B.

2. $F_2 = 1.10\,F_1$

   Density is inversely proportional to absolute temperature $F_2 = \sqrt{\frac{T_1+460}{T_2+460}}F_1 = \sqrt{\frac{600}{500}}F_1 = \sqrt{1.20}F_1 = 1.0954F_1$

   The correct answer is C.

3. Both ΔP and density change, therefore $F_2 = \sqrt{\frac{\Delta P_2 P_2}{\Delta P_1 P_1}}F_1 = \sqrt{\frac{(4)(14)}{(5)(15)}}F_1 = \sqrt{0.7467}F_1 = 0.864F_1$

   The correct answer is C.

4. $F_2 = 0.89\,F_1$

   Downstream pressure affects only the ΔP, therefore $F_2 = \sqrt{\frac{\Delta P_2}{\Delta P_1}}F_1 = \sqrt{\frac{4}{5}}F_1 = 0.894F_1$

   The correct answer is D.

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